

Report for 2002WY5B: The Wyoming Climate Atlas

There are no reported publications resulting from this project.

Report Follows:

Problem and Research Objectives:

It has nearly two decades since the last Wyoming State Climate Atlas was produced. During this period, the development and marketing of natural resources in Wyoming has accelerated in order to meet the rapidly increasing demands nationally and internationally. New Federal environmental regulations and interstate litigation over water usage and rights have also prompted the requirement for a new climate atlas. Additionally, since tourism and recreation are important economic revenue sources for the state, a new atlas that focuses on this market can only enhance the image of Wyoming.

Having completed about half of this project, it has become increasingly evident that since Martner (1986) original climate atlas, the state's climate has not changed markedly. This observation is both surprising and yet expected. With all the news and scientific research focused on observed and modeled global warming, one would expect that Wyoming was not exempted from this overall trend. Yet, as a rural state, the climate record has not been contaminated through urban heat island effects or land use changes. However since Martner landmark work, numerous weather stations have been added to the state's inventory, thus providing a higher level of depiction of various weather elements. Combined with more sophisticated merging of modeled data and graphical depictions, a new climate atlas will supplement Martner's atlas. The current three plus years of statewide drought has refocused the need for accurate and timely climate data for a wide spectrum of users. Additionally, recent research now suggests that climate changes have been very rapid over a period of years and decades then over centuries and millennia. This recognition of abrupt changes in the past reinforces concerns about the potential for significant impacts of anthropogenic climate change.

The objective of this study is to provide a data resource that will enable its users to answer the question as to how best do societies and ecosystems maintain resilience and adaptability under various climates and climate change scenario? Specific objectives include: (1) employing relational data base techniques to compile the massive quantity of data, (2) using the newest software to develop user friendly and maximum utility graphics, (3) focusing on general statewide climatology, regional (i.e., water basin or county level) and city data statistics, and (4) relating climate trends to drought and flood frequencies. With a detailed source of climate data in the form of this atlas and accompanied CD, researchers will have ready access to this important resource that should assist with their research. City planners will enhance public relations by providing the latest climate data and graphics to their informational brochures. Engineers will have a better assessment for building more efficient buildings (i.e., maximizing solar and wind power).

Methodology:

This atlas is intended to be provided in several formats to serve researchers, business, agriculture, tourists, and industry. As a hard copy book, this atlas will contain many figures and maps, some in color, as an overview of specific weather elements.

Depending on the user, additional data in the form of text, tables and graphs can be acquired from an accompanied CD. Eventually, through an internet map server, customized climate products are envisioned. This longer term project will build on the existing database from this atlas. This living document is expected to be updated on a routine bases with little if any manual input since there are multiple data sources available via the internet.

Much of Martner's descriptive work on climate governing factors, evaporation, and air quality has not changed significantly. However, additional data and statistics on severe weather, wind, precipitation frequency and intensity, and drought will be greatly expanded. New sections on lightning (figure 1), renewable energy sources (solar and wind), and agriculture (climate optimalization for plant types) are being added since technology has advanced and data availability has increased considerably in these areas.

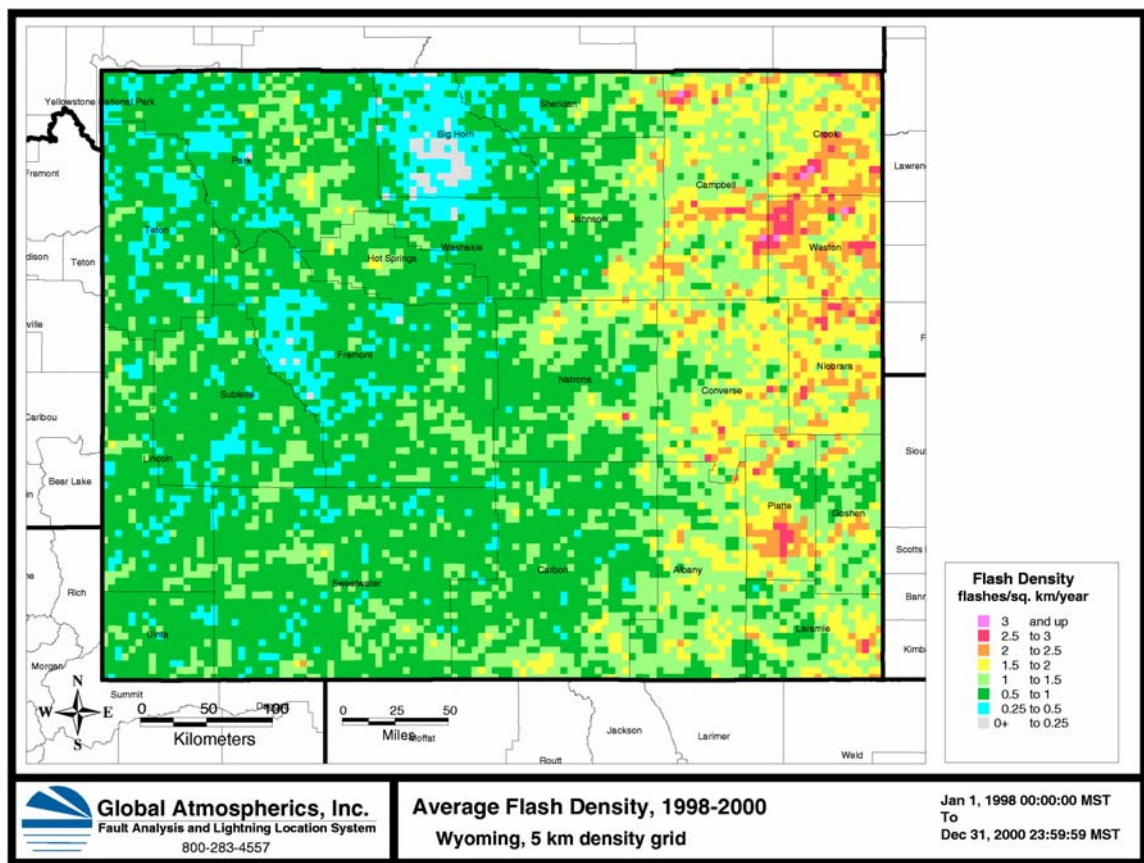


Figure 1 - Annual cloud to ground lightning frequency per sq. km resolution from 1998-2000.

The methodology employed in this study examines climate trends and specific weather parameters and relates them to user requirements. For example, a supplier of clothing for the coal-bed methane industry needs to know the frequency when the humidity is below

20 percent in order to purchase clothing that will not cause static sparking. The obvious consequence of this requires a detailed analysis.

Principle Findings and Significance:

Many possibilities for additional research exist with this concise yet expanded climate atlas. Since climatology is truly interdisciplinary by its very nature and bridges the social and physical sciences, this atlas will serve as a common reference tool across the widest cross section of academia and the general public. For example, since the start of this study, on-going research by university graduate students on tree-ring correlation to ancient droughts over the Big Horn Mountains has been conducted (Gray, 2003). This may have far reaching implication for future occurrences of multi-decadal droughts over the western US. Potential research into climate modification using cloud seeding to suppress the expansion of drought might benefit from the data contained in this state's climate atlas as well.

Student Support:

During the entire period of this study, biology major, Candice Hudson, a senior at the University of Wyoming has provided technical assistance in the compilation of the climate data that will be used in the new Wyoming Climate Atlas. She has taken digital data and created Arc View maps of numerous weather elements. Additionally, she has taken large data sets and through the use of EXCEL, has developed informative charts. Candice's work has inspired her to further her studies in the Environmental Natural Resources field at the University of Wyoming.

References:

Gray, S. T., J. L. Betancourt, C. L. Fastie, and S. T. Jackson, 2003. Patterns and sources of multidecadal oscillations in drought-sensitive tree-ring records from the central and southern Rocky Mountains, *Geophys. Res. Lett.*, 30(6), 1316, doi:10.1029/2002GL016154, 2003.

Martner, B.E., 1986. Wyoming Climate Atlas, University of Nebraska Press, pp. 432.